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The family *Hymenochaetaceae* from México 4. New records from Sierra de Álamos–Río Cuchujaqui biosphere reserve

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Abstract — *Fomitiporella melleopora*, *Fuscoporia rhabarbarina*, *Hymenochaete americana*, *Inonotus patouillardii*, and *Inonotus tropicalis* are described and illustrated as new records from México. The specimens were collected in tropical deciduous forest in the Sierra de Álamos–Río Cuchujaqui Biosphere Reserve, Sonora, México.

Key words — *Basidiomycota*, *Hymenochaetales*, taxonomy

Introduction

The *Hymenochaetaceae* was described by Donk (1948) to include fungi with annual to perennial, resupinate to stipitate, clavarioid or coralloid basidiomata with a smooth, rugose, irpiciform, hydnoid or poroid hymenophore, and developing a xanthochroic reaction in KOH. Their hyphal system is either monomitic or dimitic with generative hyphae that are always simple-septate. In addition, setoid elements (setae, hyphal setae, setal hyphae) are variably present in the hymenium, trama, or context or on the pileus surface. Most species are lignicolous and cause a white rot of dead or living wood, although some species are reported as mycorrhizal and growing in soil.

Phylogenetic analysis of sequence data of rDNA (nSSU, mtSSU and nLSU) has demonstrated that several aphyllophoroid and agaricoid fungi previously classified in various families (*Agaricaceae*, *Polyporaceae*, *Corticiaceae*, *Stereaceae* and *Hymenochaetaceae*) belong to or are closely related to the *Hymenochaetales* (Wagner & Fischer 2002, Larsson et al. 2006).

Our study expanded the knowledge about *Hymenochaetaceae* diversity in the Sierra de Álamos–Río Cuchujaqui biosphere reserve. We discuss below five species that are new to the Mexican mycobiota.

Materials and methods

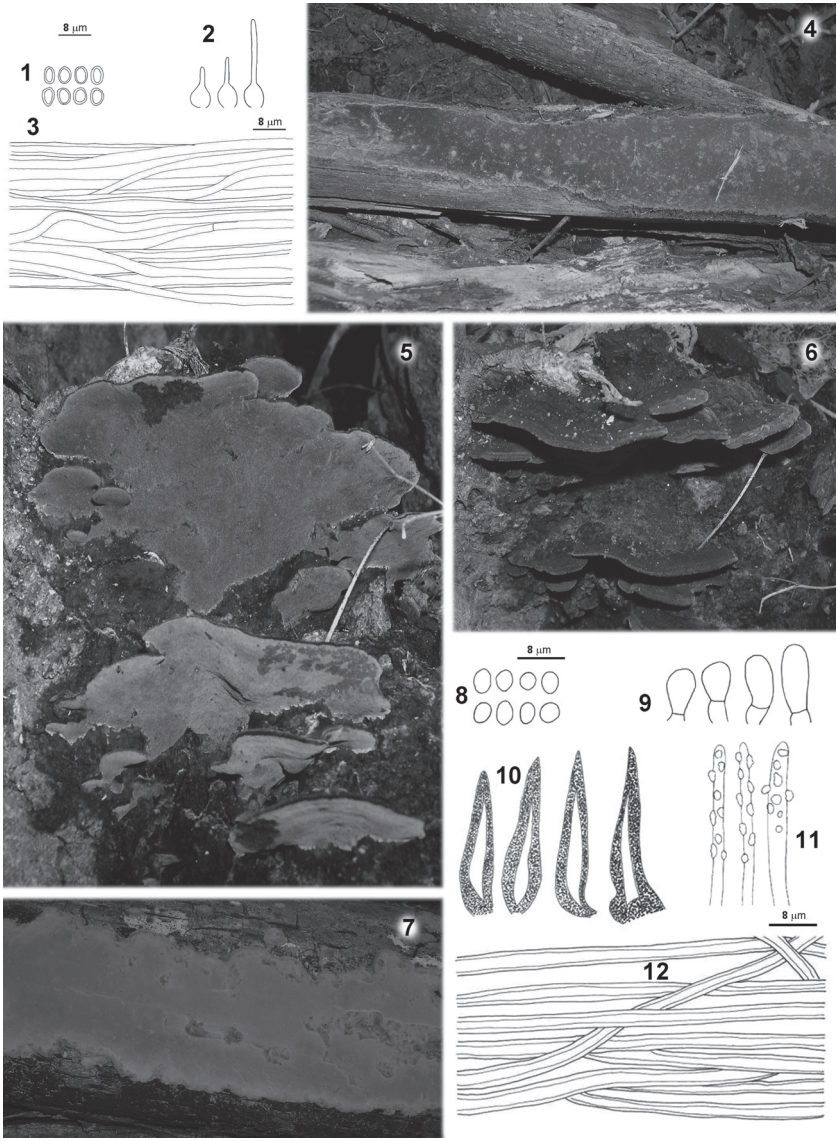
The examined specimens were collected in the Sierra de Álamos–Río Cuchujaqui biosphere reserve, Sonora, México, in September 2006. Voucher specimens are deposited in ENCB Herbarium with duplicate in CESUES. Herbarium ENCB is abbreviated according to Holmgren & Holmgren (1998). Morphological examinations followed Ryvarden (1991) and Cifuentes et al. (1986). Keys in parentheses after colors in basidiomata descriptions are following the Methuen Handbook of Colour (Kornerup & Wanscher 1978). Measurements of anatomical characters were taken from rehydrated tissues in 5% aqueous KOH and inamyloid reactions were taken with Melzer's reagent. Longitudes and latitudes were obtained with GPS etrex (Garmin). The drawling lines were made to scale and was utilized an optical microscopy with clear camera. The macroscopic pictures were taken with a Nikon Coolpix 4300.

Taxonomy

Fomitiporella melleopora Murrill, N. Amer. Fl. 9(1): 13, 1907. Figs. 1–4

Basidiome perennial, resupinate, becoming widely effused, reaching 150–250 × 25–45 × 2–5 mm, adnate, corky. Margin sterile, up to 1 mm wide, brownish yellow (5C7), golden brown (5D7) to light brown (6D8), dark brown (6F5) to black with age, matted, fimbriate. Hymenophore poroid, cracked with age, pores circular to angular, 4–6(–7) per mm, iridescent, golden brown (5D7), yellowish brown (5E7), cocoa brown (6E6), umber (6F6) to dark brown (6F7), light brown (6D5) when moved, edges thin and entire; tubes up to 4 mm deep, indistinctly stratified, tough to woody, yellowish brown (5E7), cocoa brown (6E6) to reddish brown (8E8). Context up to 1 mm thick, yellowish brown (5E8) to reddish brown (8E8), fibrous, tough, azonate, in some parts with a thin, black crust next to the substratum and it is continuous to the margin.

Hyphal system dimitic, generative hyphae simple septate, hyaline to pale yellow in KOH, simple to slightly branched, thin- to thick-walled, 2.4–4 µm diam; skeletal hyphae yellowish brown to reddish brown, unbranched or rare branched, thick-walled, 3.2–6.4 µm diam. Hymenophoral trama with parallel to subparallel hyphae, generative hyphae hyaline to pale yellow in KOH, thin- to thick-walled, non- to shortly branched, 2.4–4 µm wide; skeletal hyphae yellowish brown to reddish brown in KOH, unbranched, thick-walled, 3.2–5 µm diam. Contextual trama with slightly interwoven hyphae, generative hyphae hyaline to pale yellow in KOH, simple to scarcely branched, thick-



Figs. 1–4. *Fomitiporella melleopora*: 1. Basidiospores. 2. Cystidioles. 3. Hyphae of hymenophoral trama. 4. Resupinate basidiome. Figs. 5–12. *Fuscoporia rhabarbarina*: 5. Basidiospores. 6. Basidioles. 7. Hymenial setae. 8. Generative hyphae with incrusted crystals. 9. Hyphae of hymenophoral trama. 10. Hymenophore. 11. Pileate basidiome. 12. Resupinate basidiome.

walled, 2.4–4 µm wide; skeletal hyphae yellowish brown to reddish brown in KOH, unbranched, thick-walled, 3.2–6.4 µm diam. Setae absent in all parts. Cystidioles 12–20 × 5.6–7.2 µm, hyaline in KOH, sublageniform to ventricose-rostrate. Basidia 10–14 × 5.6–7.2 µm, clavate, tetraspored, hyaline in KOH. Basidiospores 4–4.8 × 2.8–3.2 µm, ellipsoid to ovoid, somewhat flattened on one side, pale yellow, golden yellow to pale brown in KOH, inamyloid, thin-walled to slightly thick-walled, smooth.

Ecology, range and distribution — The Mexican specimens were collected during September on dead *Cordia* wood of in caducifolious tropical forests. This species has been reported by Lowe (1966 as *Poria melleopora* (Murrill) Sacc. & Trotter) from Louisiana, U.S.A. and Venezuela and by Gilbertson & Ryvarden (1987) and Larsen & Cobb-Poulle (1990, as *Phellinus melleoporus* (Murrill) Ryvarden) from Louisiana to Florida and South America. This is the first record to Mexico in Sonora State.

Representative specimens examined — **MEXICO. Sonora: Municipality of Álamos**, Rancho Las Uvalamas, 12.IX.1994, M. Esqueda & E. Pérez-Silva (*CESUES 1814*); Mesa del Trigo (108º41'21.2"W 26º58'12.4"N) elev. 592.2 m, 14.IX.2006, R. Valenzuela *13128 (ENCB)*.

Comments — *Fomitiporia melleopora* is characterized by medium sized pores, lack of hymenial setae, and basidiospore color, size and shape. Other species with resupinate basidiomes are *F. umbrinella*, *F. cavicola,* and *F. inermis*. The first is separated from *F. melleopora* by smaller pores (7–10 per mm) and dark brown spores, the second has a similar pore size but darker and wider spores (4–5 × 3.5–4.5 µm) and grows on *Quercus* in Europe, and the third species has slightly larger pores (4–5 per mm) and and slightly larger (4–6 × 3–5 µm) reddish brown spores. *Fomitiporia caryophylli* is separated easily from *F. melleopora* by pileate basidiomata, smaller (7–10 per mm) pores, slightly smaller (3–4 × 2.5–3 µm) spores (Murrill 1907, Bondartseva & Herrera 1980, Wagner & Fischer 2002).

Fuscoporia rhabarbarina (Berk.) Groposo, Log.-Leite & Góes-Neto, Mycotaxon 101: 61, 2007. Figs. 5–12

Basidiome perennial, 10–180 × 24–62 mm, resupinate, effuse-reflexed to pileate-sessile, the pilei dimidiate to semicircular, coriaceus in thin specimens and corky in thicker specimens. Pileus 18–40 × 6–20 × 2–10 mm, plane to conchate, the surface brown (6E8), reddish brown (8E8, 8F8) to dark brown (6F7, 6F4), black with age, in section with a thin black crust, finely velutinate when young, glabrous with age, concentrically sulcate in narrow bands. Margin fertile to sterile, obtuse, light brown (6D8) to cinnamon brown (6D6). Hymenophore poroid, pores circular, entire, 6–9 per mm, cinnamon brown (6D6), brown (6E6), to reddish brown (8E8), tubes stratified, up to 5 mm deep,

concolorous with the pores. Context up to 2 mm thick, yellowish brown (5E8), with a black line developing into a cuticle from the base in pileate specimens.

Hyphal system dimitic, generative hyphae simple septate, hyaline, inamyloid, 2–4 µm diam, simple to branched; skeletal hyphae nonseptate, yellowish brown to reddish brown, unbranched, thick-walled, 3–5 µm diam. Hymenophoral trama dominated by skeletal hyphae, slightly interwoven to subparallel; generative hyphae infrequent, hyaline, thin-walled, simple to branched, 2–3.2 µm diam; skeletal hyphae dominant, yellowish brown to reddish brown in KOH, unbranched, 3–5 µm diam, thick-walled. Contextual trama dominated by skeletal hyphae, subparallel; generative hyphae infrequent, hyaline, thin-walled, simple to branched, 2–4 µm diam; skeletal hyphae dominant, yellowish brown to reddish brown in KOH, thick-walled, unbranched, 3–5 µm diam. Dissepiment edge with generative hyphae with incrusted crystals. Hymenial setae 20–30 × 4.8–7.2 µm, mostly originating from tramal hyphae and projecting in the hymenial layer up to 16 µm, subulate, reddish brown to dark brown in KOH, thick-walled (up to 1.6 µm thick). Basidia not observed, basidioles subglobose to broadly clavate, 8–12 × 5.6–10 µm, hyaline in KOH, with simple septum at the base. Basidiospores 3.2–4 × 2–3 µm, ellipsoid, hyaline in KOH, inamyloid, thin-walled, smooth.

Ecology, range and distribution — The Mexican specimens were collected in September on dead wood or living trees of *Leguminosae* in a caducifolious tropical forest. This species has been reported from Cuba, Mexico, and Costa Rica by Ryvarden (2004, as *Phellinus rhabarbarinus* (Berk.) G. Cunn.: see Comments), Argentina (as *Fomes rheicolor* Lloyd), New Guinea and Fiji (as *Phellinus rhabarbarinus*) by Ryvarden & Johansen (1980), Brazil by Groposo et al. (2007), and East China by Dai (1999).

Representative specimens examined — **MEXICO**. **Sonora**: **Municipality of Álamos**, Promonotorios (109°02'10.5"W 27°00'54.1"N) elev. 600 m, 12.IX.2006, R. Valenzuela *13041 (ENCB)*; Palo Injerto (108°43'57.9"W 27°02'50.9"N) elev 425 m, 13.IX.2006, R. Valenzuela *13072 (ENCB)*; Mesa del Trigo (108°41'21.2"W 26°58'12.4"N) elev. 590 m, 14.IX.2006, R. Valenzuela *13129 (ENCB)*; El Sabinito (108°48'14.2"W 27°00'5.5"N) elev. 377 m, 16.IX.2006, R. Valenzuela *13162 (ENCB)*, *13165 (ENCB)*, *13072 (ENCB)*.

Comments — *Fuscoporia rhabarbarina* is characterized by a glabrous pileus surface with sulcate zones and a distinctive black crust, yellowish brown context, small pores, and the size and shape of the inamyloid hyaline basidiospores. It is closely related to *F. gilva* (Schwein.) T. Wagner & M. Fisch., *F. callimorpha* (Lév.) Groposo et al., and *Phellinus roseocinereus* (Murrill) D.A. Reid, all of which differ in lacking a black crust on the pileus. Ryvarden & Johansen (1980) and Corner (1991) considered *P. roseocinereus* to be a synonym of *P. callimorphus* (Lév.) Ryvarden; later, Ryvarden (2004) considered both names to be synonyms of *P. rhabarbarinus* (based on Mexican and Cuban specimens identified as *P. roseocinereus*). Loguercio-Leite & Wright (1995) studied

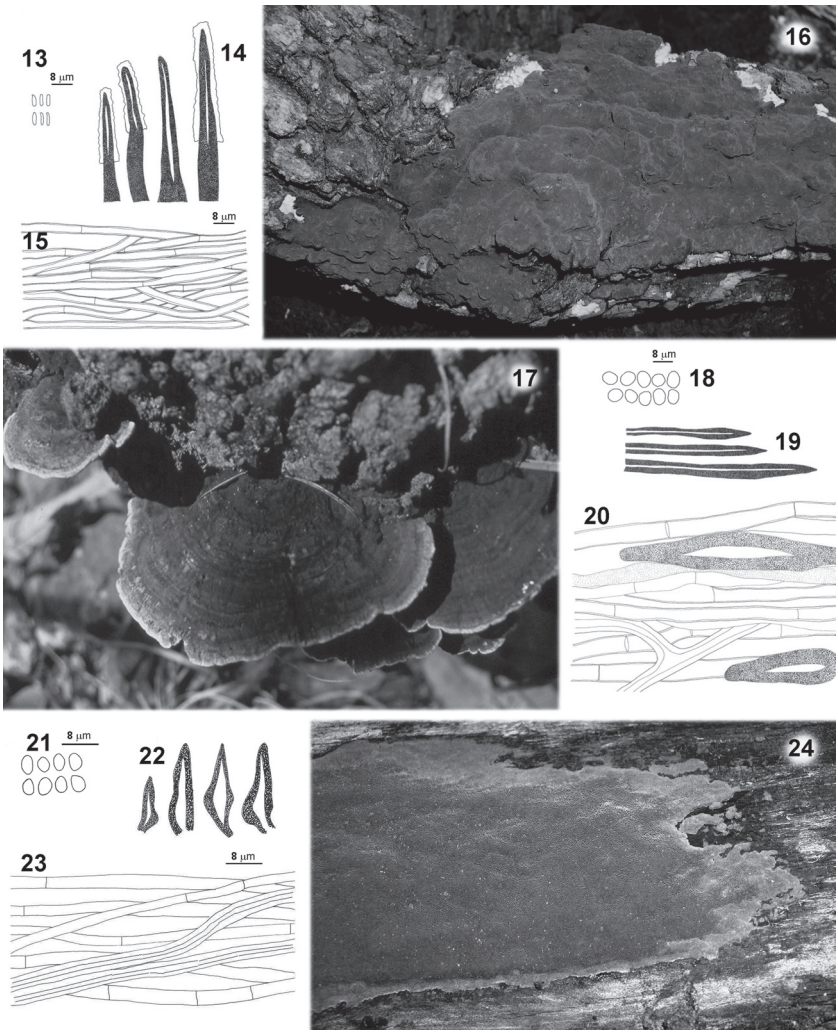
P. roseocinereus specimens from Guadaloupe and México and evidenced great similarity with Jamaican and Brazilian specimens of *P. callimorphus*. Mexican specimens of ENCB herbarium identified as *F. callimorpha* and *P. roseocinereus* are very different from the Sonoran specimens of *F. rhabarbarina*. Larsen & Cobb-Poulle (1990) considered these species as autonomous. Resupinate, effuse-reflexed and pileate-sessile basidiomata were present in all Mexican specimens examined, probably due to climatic conditions.

Hymenochaete americana Gresl. & Parmasto, Folia Criptog. Estonica 37: 59, 2001. Figs. 13–16

Basidiome annual, 26–30 mm diam, very thin (less than 1 mm thick), resupinate, crustose, then confluent, papiraceus, separable, fragile, brittle in dry specimens. Hymenophore smooth, with scattered rounded tubercles, slightly cracked, cocoa brown (6E6) to chocolate brown (6F4), grayish brown (6E3) to the margin. Margin sterile, up to 1 mm broad, golden brown (5D7) to light brown (6D8). Context very thin, composed of a thin layer of hyphae and stratose setal layer, overhead of context, there is a thin dark layer called cortex and over this layer there is a tomentum.

Hyphal system pseudodimitic, generative hyphae yellowish to yellowish brown in KOH, simple septate, with thick-walled, 2–3.5 µm diam; skeletal hyphae brown to reddish brown, without or simple septate very distant, thick-walled, 3–4.5 µm diam. Cortex 16–56 µm thick, hyphae subparallel, densely agglutinated, brown to dark brown in KOH, hard to characterize. Tomentum 50–80 µm thick, hyphae loosely interwoven, yellowish brown in KOH, with simple septate, thick-walled, 4–5 µm diam. Contextual hyphal layer thin, hyphae more or less loosely interwoven to subparallel arranged, generative hyphae yellowish to yellowish brown, 2–3.4 µm diam; skeletal hyphae brown to reddish brown in KOH, 3–5 µm diam. Setal layer 50–350 µm thick, non distinguish from the contextual layer, 1–3 stratus; setae numerous, 80–120 × 8–12 µm, projecting 50–70 µm of the hymenium, subulate to fusiform, with acute tip, straight, naked or incrusted with small groups of polyhedric crystals, sometimes crystals forming a narrowly conical cap. Cystidia and hyphidia absent. Basidia 18–22.4 × 5.6–6.4 µm, tetra-spored, clavate to cylindrical, hyaline to yellowish in KOH, sterigmata 3–4 µm long. Basidiospores 8–9.6 × 2.4–3.2 µm, cylindrical, slightly curved, hyaline in KOH, inamyloid, smooth, thin-walled.

Ecology, range and distribution — The Mexican specimen was collected during September on dead oak in a *Quercus* forest. This species has been reported from South America (Tierra del Fuego, Argentina, and Río Grande do Sul, Brazil) and North America (Arizona, U.S.A.) (Parmasto 2000, 2001). This is the first record to Mexico in Sonora State.



Figs. 13–16. *Hymenochaete americana*: 13. Basidiospores. 14. Hymenial setae. 15. Hyphae of the subiculum. 16. Basidiome. Figs. 17–20. *Inonotus patouillardii*: 17. Basidiome. 18. Basidiospores. 19. Hyphal setae. 20. Hyphae of hymenophoral trama with hyphal setae. Figs 21–24. *Phellinus tropicalis*: 21. Basidiospores. 22. Hymenial setae. 23. Hyphae of hymenophoral trama. 24. Basidiome.

Representative Specimen examined — **MEXICO. Sonora: Municipality of Álamos**, La Cañita (108º38'59.52"W 26º59'32.6"N) elev. 657 m, 15.IX.2006, R. Valenzuela *13074 (ENCB)*.

Comments — This species is characterized by thin, resupinate basidiome, incrusted setae with crystals forming a narrowly conic cap, and cylindrical, slightly curved basidiospores. *H. allantospora* Parmasto, a similar species with effuse-reflexed basidiomata and incrusted setae, is distinguished by rare and larger setae that lack narrowly conic crystal caps and larger curved to allantoid spores.

Pseudochaete tabacina (Sowerby) T. Wagner & M. Fisch., which is also morphologically similar, grows on *Quercus*, and has resupinate to effuse-reflexed basidiomata, is differentiated by smaller spores and mostly naked setae or slightly incrusted with granules or small crystals. Parmasto (2000, 2001) noted that *Hymenochaete vaginata* G. Cunn. appears to be closely related to *H. americana*, but the first differs in sometimes possessing effused-reflexed basidiomata, presence of numerous hyaline, yellow or pale brown hyphidia, larger setae 90–160 × 9–14 μm encrusted or not with small crystals, and somewhat smaller basidiospores.

Inonotus patouillardii (Rick) Imazeki, Bull. Tokyo Sci. Mus. 6: 105, 1943.

Figs. 17–20

Basidiome annual, 50–80 × 40–56 × 24–38 mm, pileate-sessile, dimidiate to semicircular, corky, hard when dry. Pileus convex to plane, light to reddish or dark brown at the base (6D8, 6E8, 7E8, 8E8, 7F4), blackening when old, first adpressed tomentose, then glabrous, concentrically zoned with dark lines contrasted with different brown zones, also radially wrinkled to the margin, cracked with age. Margin thin to moderately thick, sterile, light yellow (4A4) to yellowish brown (5D8), entire o slightly incised to wavy. Hymenophore poroid, pores rounded, 3–4 per mm, in various tones of brown, cinnamon brown (6D6), cocoa brown (6E6), reddish brown (8E8, 8F8), dark reddish brown (8F6) to umber brown (6F6) in oldest specimens, entire to lacerate dissepiments; tubes 5–12 mm deep, cinnamon color (5D6), to brown (6E7) to dark reddish brown (8F6) with pale yellow (4A3) mycelia stuffed tubes in older specimens. Context up to 20 mm thick, chestnut (6F8) to dark brown (7F4), zonate, fibrous and lustrous, very hard when dry.

Hyphal system monomitic, generative hyphae simple septate, pale yellow to dark brown in KOH, simple to branched, thin- to thick-walled, 2.4–8 μm diam. Hymenophoral trama with parallel to subparallel hyphae, pale yellow, yellowish brown to reddish brown in KOH, thin- to thick-walled, simple to slightly branched, 3.2–6.4 μm wide. Contextual trama with two types of hyphae, one formed by parallel to subparallel hyphae, yellowish brown to reddish brown in KOH, simple, some scarcely branched, separated, with spaced septa, 5–8 μm wide; the other type formed by interwoven hyphae contorted, branched, reddish brown to dark brown in KOH, with frequent septa, 2.4–5

µm, they are mixed with the parallel hyphae. Hyphal setae abundant in hymenophoral trama, rare in context, up to 450 µm long, 8–12 µm wide, parallel to hymenial layer, but occasionally projecting downward up to 120 µm past hymenium, dark brown in KOH, broadly ellipsoid, pale yellow, golden yellow to rusty brown in KOH, inamyloid, thin- to thick-walled, smooth.

Ecology, range and distribution — The Mexican specimen was collected during September on dead oak in a *Quercus* forest. This species has been reported from Africa (Ryvarden & Johansen 1980), Arizona in U.S.A. (Gilbertson & Ryvarden 1986), Brazil (Loguercio-Leite & Wright 1991), Japan (Nuñez & Ryvarden 2000) and from Uruguay to Costa Rica (Ryvarden, 2004). This is the first record to Mexico in Sonora State.

Representative specimen examined — **MEXICO. Sonora: Municipality of Álamos**, La Cañita (108º38'59.52"W 26º59'32.6"N) elev. 657 m, 15.IX.2006, R. Valenzuela *13079 (ENCB)*.

Comments — This species is characterized by the zonate pileus with alternating brown and black zones, hard, lustrous context, conspicuous hyphal setae and basidiospore color, shape and size. Other *Inonotus* species with pileate basidiomata, hyphae setae, and *Quercus* habit are *I. glomeratus* (Peck) Murrill, *I. quercustris* M. Blackw. & Gilb., and *I. rickii* (Pat.) D.A. Reid. The first species is separated from *I. patouillardii* by azonate pileus, abundant hymenial setae, and paler spores; the second species is distinguished by its larger, hirsute basidiomata, larger basidiospores, and growth in living *Quercus*; the third species has chlamydospores in context and produces a *Ptychogaster* anamorph. Ryvarden & Johansen (1980) and Nuñez & Ryvarden (2000) mention that specimens from Africa and Japan possess hymenial setae while American specimens lack setae.

Inonotus tropicalis (M.J. Larsen & Lombard) T. Wagner & M. Fisch., Mycologia 94: 1009, 2002. Figs. 21–24

Basidiome annual to biennial, resupinate, effused, reaching 100–350 × 50–150 × 3–5 mm, adnate, corky. Margin sterile, up to 2 mm wide, sulfur yellow (1A5), brownish yellow (5C7), golden brown (5D7) to yellowish brown (5E8), velvety to matted. Hymenophore poroid, pores circular to angular, 7–9 per mm, golden brown (5D7), yellowish brown (5E8), rust brown (6E8) to reddish brown (8E8), dark brown in oldest specimens (7F6), edges rather wide and entire; tubes up to 4 mm long in a layer, fragile to tough, concolorous to the pores. Context up to 1 mm thick, yellowish brown (5E8) to reddish brown (8E8), fibrous and soft.

Hyphal system pseudodimitic, generative hyphae simple septate, hyaline, pale yellow to yellowish brown in KOH, simple to slightly branched, thin- to thick-walled, 2.4–4 µm diam; skeletal hyphae without or very distant septa, yellowish brown to reddish brown, unbranched, thick-walled, 3.2–5 µm diam.

Hymenophoral trama with parallel to subparallel hyphae, generative hyphae hyaline, pale yellow to yellowish brown in KOH, thin- to thick-walled, simple to slightly branched, frequent to spaced septa, 2.4–4 µm wide; skeletal hyphae without or simple septate very distant, yellowish brown to reddish brown in KOH, unbranched, thick-walled, 3.2–5 µm diam. Contextual trama with slightly interwoven hyphae, generative hyphae pale yellow to yellowish brown in KOH, simple to scarcely branched, with spaced septa, thick-walled, 2.4–4 µm wide; skeletal hyphae without or very distant septa, yellowish brown to reddish brown in KOH, unbranched, thick-walled, 3.2–5 µm diam. Hymenial setae very abundant, occurring in clusters or fascicles around pore apertures, 12–24 × 5–8 µm, ventricose to subulate, projecting up to 8 µm, reddish brown to dark brown in KOH, thick-walled (up to 1.6 µm thick). Basidia 6.4–10 × 4–5.6 µm, clavate, tetra-spored, hyaline to pale yellow in KOH. Basidiospores 3.2–4.8 × 2.4–4 µm, hyaline and subglobose when young, ovoid to broadly ellipsoid, pale yellow, golden yellow to pale yellowish brown in KOH when mature, inamyloid, thin-walled, smooth.

Ecology, range and distribution — The Mexican specimens grow in September on dead angiosperm wood in caducifolious tropical forest. This species has been reported from Brazil and Costa Rica (Larsen & Lombard 1988; Larsen & Cobb-Poulle 1990) and Mississippi in U.S.A. (Lowe 1966; as *Poria rickii* Bres.) This is the first record to Mexico in Sonora State.

Representative specimen examined — **MEXICO. Sonora: Municipality of Álamos**, El Aguaje (108º45'48.9"W 26º56'45.9"N) elev. 452.2 m, 14.IX.2006, R. Valenzuela *13097 (ENCB)*.

Comments — This species is characterized by a resupinate basidiome, small pores, small and abundant hymenial setae, and basidiospore color, size, and shape. It was described (as *Phellinus tropicalis*) by Larsen & Lombard (1988) with annual basidiome and two kinds of contextual hyphae, generative hyphae, and thick-walled, infrequently simple-septate skeletal hyphae. Lowe (1966) pointed out that *P. tropicalis* (as *Poria rickii,* a synonym) has an annual to biennial basidioma with a monomitic hyphal system with occasionally and inconspicuously simple-septate contextual generative, characters typical of *Inonotus*. Wagner & Fischer (2002) transferred *P. tropicalis* to *Inonotus* after phylogenetic analysis of *Phellinus* and *Inonotus* derived from rDNA nLSU sequence data.

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